

ART. V.—*The Cherts and Diabase Rocks of Tatong.*

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(With Plate IX.).

[Read 9th April, 1908].

In Vol. I., part 4 (1907) of the Records of the Geological Survey, Mr. A. M. Howitt briefly describes a series of cherts with associated hornblendic dyke occurring about a mile to the south-east of Tatong township. From the similarity of these rocks to the cherts of Heathcote, Mr. Howitt concludes that they probably belong to the Heathcotian series described by Professor Gregory.⁽¹⁾

In December, 1905, I accompanied members of the Benalla-Tolmie Railway League from Benalla to Tolmie via Tatong and Spring Creek, and in a brief report in the "Benalla Standard" of the geological features along the proposed route, I recorded the presence of a large area of diabasic rocks near the junction of the Holland's Branch of the Broken River, and one of its tributaries, Spring Creek. Cherty rocks were found associated with the diabase, and the general lithological character of the series showed that they presented strong resemblances to the Heathcote rocks, and consequently they were recorded as being probably of Heathcotian age, that is, of pre-Ordovician age.

On further investigation, however, no sharp junction could be found between the cherty series, and the less altered sedimentary rocks with which, in Mr. Howitt's map, they are shown in contact, and one is forced to the belief that the two form only a single series in which a gradually increasing metamorphism can be noticed as the diabases are approached, the cherts representing the extreme stage of such alteration.

¹ Proc. Roy. Soc. Victoria, vol. xv. (N.S.), pt. ii. (1903), p. 148.

The Diabases.

The largest area of diabase occurs to the east and north-east of Mt. Samaria, the highest point in the district. This area is shown on the Geological Map of Victoria as belonging to the older volcanic series, but is entirely distinct from these rocks, both in structure and occurrence. The diabase runs in a north-westerly direction from a point about four miles north-west of Hat Hill, and forms a high ridge along the western side of the Holland's valley. This ridge rises to a height of 2700 ft., above sea level, and is capped in places by a conglomerate consisting mainly of pebbles of quartz and quartzite in a siliceous cement.

For some distance the Holland's Branch marks the junction between the diabase and the Devonian porphyry, but near M. Ford's allotment the river takes a fairly sharp turn to the west, and cuts across the diabase and the continuation of the ridge extends into the Parish of Toombullup, forming Bunning Hill. The upper portion of Spring Creek runs along the western boundary of the diabase, but near the junction of Spring Creek and the Holland's Branch the diabase crosses the creek valley and forms portions of the northern end of Blue Range, and extends through this ridge into the valley of Samaria Creek.

On the other side of Samaria Creek, and only separated from the main mass by alluvial flats, are a series of low hills of diabolic rocks, which occupy portions of allotments 65, 66, 70, 71, 72 and 73, Parish of Moorngag.

Further to the north, in allotments 41, 42, 43, 44 and 45, diabolic rocks form a ridge running in a north-easterly direction, the northern extension being overlain by cherty rocks.

The Cherts.

In the larger area of diabase numerous patches of metamorphic rocks are found, but these seem to be detached blocks resting on the surface of the igneous rocks, and are not definitely in situ, so that their relationship to the diabases is extremely obscure. They consist partly of chert, but are more chalcedonic than in the other areas. Jasperoid rocks and silicified diabase are also common.

At the southern end of allotment 69, Parish of Moorngag, and overlooking Samaria Creek valley, is a splendid outcrop of metamorphic rocks. These rocks are mainly grey and white cherts, in which the silicification has not been quite so intense as in other localities. The bedding is very distinct, and as the beds are exposed in an almost vertical face nearly 40 ft. high, the dip and strike are easily obtainable. The strike of the beds is N. 70 deg. W., and the dip N. 20 deg. E., at an angle varying between 35 deg. and 40 deg.

Proceeding up the hill above these beds one passes over less silicified beds until at the top of the rise micaceous sandstones and indurated shales, which are no more altered than the ordinary Ordovician and Silurian sediments found in the neighbourhood of igneous rocks, seem to overlie the cherts perfectly conformably, the strike and dip of these beds being almost identical with that seen in the cherts.

In allotment 68 we have more evidence that the cherts and sandstones form one series. Near the southern fence of this block beds of micaceous sandstones are exposed, and they are seen to be almost vertical and to strike N. 30 deg. E. Twenty-two yards to the south of the sandstones are beds of cherts which agree exactly both in strike and dip with the sandstones. About 100 yds. still further to the south, in allotment 67, more sandstones are found. These beds are also nearly vertical, and the strike is N. 25 deg. E. There seems little doubt, therefore, that at this point the cherts and sandstones are interbedded, and consequently belong to the same horizon.

On Mr. Howitt's sketch map a sharp junction is shown between the Heathcotean (?) cherts and beds marked in as of Silurian age. These so-called Silurian beds at first sight seem entirely distinct from the cherty rocks, typical specimens from the two series showing no similarity to one another. As Mr. Howitt's time was extremely limited, he had no opportunity to examine the junction, as shown on the map, and consequently sketched in an approximate boundary between the two types of sediments. When one comes to examine the rocks near the supposed junction, it is found impossible to separate the two series, as they merge gradually into one another. Passing from the fairly normal sediments, which consist of shales and sandstones, the shales being much more in evidence than the sand-

stones, we come to more indurated shales, and moving on towards the metamorphic area the shales show more and more silicification, until they ultimately pass into undoubted cherts. The sandstones do not show the same amount of alteration, but become more micaceous. It must be stated that the evidence in this area is not as satisfactory as one could wish, because the surface is covered with soil, and the nature of the underlying rock can only be judged by the fragmentary material on the surface.

About three miles north of Tatong township a triangular area of silurian rocks is shown in Mr. Howitt's map. The rocks in this area consist of sandstones, quartzite, slates, together with bands of what may be termed chertified slates. These beds are intensely indurated, but the silicification is not quite as far advanced as in the case of the typical cherts, and I think they undoubtedly represent an intermediate stage between the cherts and normal slates.

Relation of the Rocks in the Area.

In the area under consideration the following palaeozoic rocks have been recorded:—Heatcotician (?), Upper Ordovician, Silurian, Lower Devonian porphyries and Upper Devonian conglomerates, while to the south-east are the Carboniferous sandstones of Mansfield.

The age ascribed to the porphyries seems correct, as they are intrusive into the Silurian in the Broken River valley, and are overlain to the south-east by the Lower Carboniferous sandstones. Flanking the porphyries, and apparently resting on them, are beds of conglomerate, which the Survey have recorded as of Upper Devonian age. These conglomerates consist of rounded pebbles of quartzite, with occasional fragments of chert, and where the conglomerate occurs near the diabase, numerous diabasic pebbles are found. There is an entire absence of porphyry pebbles in the conglomerate, even where the conglomerate is directly in contact with the porphyry. In the bed of the Holland's, about half a mile below Dodd's Crossing, the porphyry is clearly seen intrusive into the conglomerate, so that the conglomerate beds are older than the porphyry, and therefore are probably of Silurian age. If further evidence were

required to prove their pre-Devonian age, it would be furnished by the character of the pebbles, many of which show dimples caused by intense pressure of one pebble against another during earth movements. If the beds were not in existence prior to the Devonian earth movements, it is extremely difficult to explain the dimpled nature of the pebbles, as there is no evidence of subsequent folding in this area. The conglomerate probably formed a shore-line deposit in the Silurian sea, and is part of the same series as the Silurian conglomerates near Mansfield.

The cherts were altered prior to the formation of this conglomerate, as fragments of both chert and diabase are found in the conglomerate, and, further, the conglomerate rests uncomfortably on the upturned edge of the sandstones and shales of the triangular patch already referred to, lying about three miles north of Tatong. This area is mapped as of Silurian age, but a note on Mr. Howitt's map states that the boundaries between the Silurian and Ordovician beds have not been defined. If the Silurian age of the conglomerates be accepted, these beds would seem to be not younger than Upper Ordovician, as there is a big unconformity between the two. The conglomerate is found in parts directly resting on the sandstone and chert beds. The cherts and diabase, therefore, are of pre-Silurian age, and the evidence in this area points to the age being Upper Ordovician, rather than pre-Ordovician. The evidence as to age is scanty, as no fossils of any description have been found in the Tatong area, and the nearest fossiliferous beds are some distance to the north-east.

At Edi and Myrrhee, to the east and north-east of the cherty area, graptolites have been found in the beds containing the turquoise deposits. These fossils were submitted by the Mines Department to Mr. Hall, and although they were poorly preserved, he was able to identify sufficient genera to show that they were almost certainly of Upper Ordovician age. To the north-west, at the Reef Hills, Benalla, sandstones have yielded fossils of Silurian age, and to the south-west are the Silurian sandstones and limestones of Loyola and the Mansfield area.

Mr. Howitt has recorded the strike of the Ordovician beds as being N. 40 deg. W., and that of the metamorphic rocks as N. 35 deg. W. The strike of the beds in the area north of Tatong

is N. 40 deg. W. Unfortunately these strikes are in areas fairly widely separated from one another, and so have not much significance; still they certainly show no evidence of unconformity between the Ordovician and the cherty series. In this area, therefore, the most natural position in which to place the cherts is the Upper Ordovician, what little evidence of age there is recorded being in favour of this view, and it is only comparison with the Heathcote district that makes one consider the possibility of the cherts belonging to the pre-Ordovician.

The relation of the cherts to the diabase is difficult to determine, as there is no exposure of any sharp junction between the two, the whole surface being generally covered with rich diabasic soil. Mr. Howitt recorded a hornblendic dyke traversing the cherts, so that if this dyke be connected with the diabases, the cherts must be the older series.

In general the metamorphism of the sediments seems to increase towards the contact, but exceptions to this rule may be observed.

In allotment 6, Parish of Toombullup North, is an occurrence of Selwynite similar to that obtained from Heathcote; but its relation to the other rocks is obscure, as it is surrounded by alluvial material. This is of considerable interest, as it serves as a link to connect up the Tatong area with the Heathcote area.

Petrology of the Rocks.

As I have had no opportunity yet of sectioning and examining the rocks of this district microscopically, the petrological description of the igneous and metamorphic rocks must be deferred until some future time.

Conclusions.

In the Tatong area the cherty series are interbedded with fairly normal sediments, and there is a gradual passage from normal sediments through all stages into cherts. This means that if the Tatong and Heathcote series are contemporaneous, then we must include in the Heathcotian, normal sediments as well as cherts and diabases. If this be accepted, then the distinctive characteristics of the Heathcotian series lose their full significance, and it becomes extremely difficult, if not impossible,

to separate them from the Ordovician and Silurian rocks unless fossils are obtained and the question of the pre-Ordovician age of the

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and that the cherty rocks are post-dabase and not necessarily of the same age as one another, and consequently the cherts may be pre-Ordovician in the Heathcote area, and Upper Ordovician in the Tatong area.

EXPLANATION OF PLATE IX.

FIG. I.—Sketch Map of the Tatong District.

